

'I don't understand the matter at all, Mr Litton,' said she nervously. 'Everything has been so strange and terrible, that it may well have done away with my poor wits; but this poor brigand woman, it seems, is dying; and though Lilian is most unfit to be her companion under such circumstances, she has insisted upon being with her, and now you have been sent for to see them both—alone.'

Walter's heart was too full to speak; he only bowed, and followed Lotty through the door that led into the sick-room. She ushered him within it, and then immediately withdrew, taking Julia and Lavocca with her; and Walter found himself alone with the two women, to each of whom—but out of devotion to one of them—he had plighted his troth. Joanna, looking strangely unlike herself in feminine garb, and with features from which the near approach of death had chased every touch of harshness, and left all womanly, was lying on Lilian's couch; while Lilian—with cheeks as pale as those of her companion, and which she in vain strove to keep free from tears—was sitting in an arm-chair by her side. She signed to him in silence to draw near Joanna.

'I have sent for you, Signor Litton,' began the latter, in weak and broken tones; when a gentle hand was suddenly placed upon her arm, and a soft voice interrupted her with: 'Why not call him Walter?' 'Ah, you have a good heart,' murmured the dying girl. 'Yes, I will call him Walter, since it is for so short a time.—Walter, I have sent for you, to bid you farewell. The doctor tells me—though indeed I felt that it was so before he came—that I am dying. It is better that this should be, even on my own account, for what had I to live for save a love that could never be returned; and upon yours, how much better, since it will set you free.'

Walter's eyes were fixed upon her with an ineffable tenderness and pity, as he replied: 'Do you suppose, then, that I wish you to die, Joanna, you who have just preserved my life?'

'No; you are too generous, too unselfish, to wish that; but, nevertheless, my death will make you happy, and therefore death is welcome to me. It was but a mad dream of mine—but I am a poor ignorant foolish girl—that I could ever win your love. I see that now. Yet you won mine, all that I had to give, Walter, and you will keep it still; not like this other one's' (here she smiled on Lilian); 'yet something not altogether worthless to think of now and then, and draw a sigh from you. I hope that I shall not be quite forgotten, Walter!'

'You will never be forgotten, Joanna, while the life that you have given still abides within me.'

'And if I had lived, you would have kept your word?'

'I would have made you my wife, so help me, Heaven!'

'Brave heart, brave heart!' continued Joanna. 'He tells the truth to man and woman.—You knew this before, Lilian, but he did not know you knew.—Give me your hand, Walter. This hand is mine,' she murmured, carrying it to her parched lips, 'and I have the right to dispose of it.—Now, Lilian, give me yours.' Then she took Lilian's hand, and placed it in Walter's. 'You are worthy of him; you will make him happy, as I never could have done. May Heaven bless you both!'

The physical exertion she had used had been very slight, yet she seemed greatly exhausted.

Indeed, Joanna, you must say no more,' whispered Lilian, caressing her. 'Walter must go away for the present; you are doing yourself harm.'

'As you please,' murmured Joanna with a sad smile, 'though I do not think I can take harm. But before he goes—he is yours now, Lilian; I have made him over to you—may I ask of him to kiss me?'

Walter bent low, half-blind with tears, and gave Joanna his first kiss: it was his last one also; for she died within an hour or so, quite suddenly, in Lotty's arms, whom she took for Lilian, whose scanty strength had succumbed to the late excitement.

'Be good to him, dear,' were the poor girl's last words. 'He is worth all love can give him.'

NARCOTICS. BRAE

THE indulgence in narcotics—something to dull, stupefy, and soothe the nervous system—is a predominant human weakness. Nature has been ransacked for narcotics. Tobacco, opium, betelnut, Indian hemp, even some kinds of fungi, are employed for the desired object. When tobacco was first introduced into Europe, its use was nearly everywhere looked upon with dislike by the authorities. The efforts that were made to suppress it amounted to nothing less than persecution, and their want of success furnishes a curious illustration of the uselessness of legislative interference with the individual's legitimate freedom of action. It serves also to illustrate in some measure the strong hold which the taste for narcotics obtains over the mind, especially as tobacco is one of the mildest narcotics in use. Amongst ourselves, not to mention King James's well-known *Counterblast*, many petty restrictions were laid on the sale of tobacco during that monarch's reign, and the import duty was raised from twopence to six shillings and tenpence a pound. In England and elsewhere, remonstrance and penalties were equally unavailing. Tobacco made its way steadily into favour, and is believed to be now in use among not less than eight hundred millions of the human race.

Measures of a severe nature have been tried in China to check the use of opium, and have been quite as unsuccessful. However apathetic the Chinese may be in respect to most things, they will not submit to the withdrawal of their favourite narcotic. But in case of so dangerous a poison, some restrictions are as much needed as they are on the sale of spirituous liquors amongst ourselves; for the effects of habitual excess are not less deplorable than those of habitual drunkenness. Of forty prisoners confined in the House of Correction at Singapore, thirty-five were found to use opium; and of these, seventeen, who had been in receipt of eighteen shillings a month as wages, spent twenty-four shillings on opium, the difference being obtained by theft. From a sanitary point of view, the results are equally sad. The confirmed opium-eater in the East seldom lives beyond the age of forty, and may be recognised at a glance by his trembling steps and curved spine, his sunken glassy eyes and sallow withered features. The muscles, too, of his neck and fingers often become contracted. Yet incurring even this penalty

Whether they referred to Lilian's state of health, or her feelings towards himself (of which he had never spoken openly to her father), he did not know, but it brought her home to his remembrance, and in so doing, seemed to do a wrong to his wounded charge.

'This young woman, to whom we owe so much,' continued Mr Brown, misunderstanding his glance, 'will of course be taken to our hotel, to be tended by my daughters like a sister.'

'Indeed, she deserves no less, sir,' answered Walter solemnly.

Nothing more was said until they drew near the city, when Mr Brown once more broke silence: 'I wonder whether that scoundrel Selwyn will venture to look me in the face?' The old merchant's mental vigour was evidently returning to him, now that he had reached the confines of civilisation; while Walter, who had been the leading spirit throughout their common dangers, felt, on the contrary, more perplexed and subdued with every footfall. Notwithstanding the earliness of the hour, a great crowd, upon whom Joanna's dark eyes rested without seeming to observe their presence, accompanied the procession to the hotel, where the good news had already penetrated, and on the steps of which stood the landlord, to do honour to their arrival.

'Is Sir Reginald Selwyn within?' was Mr Brown's impatient inquiry, delivered in very disinherited tones.

'No, sir; he left yesterday by the steamer to Messina. Her ladyship, your daughter, however, did not accompany him.'

In another minute, ere he reached the head of the stairs, the old man was clasped in Lotty's arms. To his astonishment, and still more to that of Walter, Lilian herself, pale and trembling, and looking like one risen from the grave, was standing at the doorway of the sitting-room. But ere she could shape the words of welcome, her eyes fell upon the litter, as it was slowly borne up-stairs, and concluding, doubtless, that it contained Walter, sick or wounded, her feeble strength forsook her, and she would have fallen senseless on the floor, but for her father's aid. He kissed her tenderly; and then, still hugging her to his breast, observed to Lotty: 'You will have two patients to nurse now, my girl, instead of one.—This is a woman—though you wouldn't think so,' continued he, pointing to Joanna—'and one to whom Walter and myself are indebted for our lives. And here is another young person in male attire. We have been in very queer company of late, as you will conclude; but these two are by far the best specimens of it, I do assure you.'

It was quite curious to see how quickly the old merchant had recovered from his late depression, and how naturally he reassumed the position of host and master, which he had occupied before his late misfortunes. Poor Lavocca, on the other hand, bereft of her lover, alarmed for the fate of her only friend, and overcome by the strangeness of the scene, so different from those of her mountain-life, looked piteous and disconsolate enough, and kissed the hand which Lotty held out to her with grateful humility.

'Now, Walter, my lad,' continued Mr Brown, 'you had better go home and make yourself comfortable, while I do the like, and then come up here to breakfast, and hear the doctor's report. I

have sent for the best in the place; and if money can save her, Miss Joanna shall not want for life, or anything that life can give her.'

Walter would have hesitated to obey this order, for he felt that his place was by the side of the wounded girl, whom he had promised to make his wife; but the arrival of the surgeon, who instantly ordered the patient to be conveyed into the inner room, and the apartment to be cleared, put the matter beyond his power, and compelled him to retire to his lodgings. Here he remained in a strange state of anxiety and suspense, scarcely knowing what to hope or what to fear; now moved with tender pity for Joanna, now filled with still more tender regrets upon Lilian's account; and very ill inclined to listen to the congratulations with which Baccari and his son overwhelmed him, but which gratitude compelled him to acknowledge. For it was indeed to the interest which Francisco had taken in him, and the promptness with which he had acted, upon seeing him depart with Santoro, that his rescue had been due. The lad had entertained some suspicion of his not being a free agent, during those last days he had spent in Palermo, and had watched his proceedings accordingly; had dogged him to the gate of the cemetery, and contrived to overhear the name of the locality where Corrali had pitched his camp. Then, when convinced of the young Englishman's departure and its object, he had hurried to the consul with the letter Walter had left behind him, and had also delivered that for Lilian into the hands of his mistress, her attendant. In consequence of these rapid measures, the troops had been sent out forthwith, with better information than usual as to the direction in which to march, and with orders to surround the mountain. The impatience and fury of Corrali himself had done the rest. But besides sending out the troops, the tidings thus disseminated by Francisco had roused public indignation, not only among the British residents, but with the natives themselves, against Sir Reginald; and it was amid a storm of hisses and execrations that he had embarked on board the steamer on the previous afternoon. He had not indeed been driven to do so by the general indignation; his natural courage would probably have been too high for that; but after having witnessed Walter's departure, he had felt inaction insupportable. To stay in Palermo and await the news of the massacre that he could have prevented by the mere signing of his name, was something that even his iron nerves refused to face; and therefore he had taken his place for Messina. He would willingly have carried Lotty with him, since, in her despair and wretchedness at the coming catastrophe, she was only too likely to drop some hint that would lead to his inculpation; but, on the other hand, to tear her away at such a time from her sick sister, was an act which would set every tongue wagging against him, and still more certainly arouse suspicion. So Sir Reginald had gone alone, to the great relief of all concerned, save the mob, who wished to duck him, and Mr Brown, who—no longer restrained by sentiments of respect for the baronet of the United Kingdom—yearned to give him a piece of his mind.

In the midst of these details came a message from the hotel, to say that Walter's presence was required there at once; he hurried thither, and found Lotty awaiting him in the sitting-room alone.

will enable him to indulge his vice only for a certain length of time. Unlike the healthy enjoyment which we derive from our appetite of hunger, and which Nature herself renews periodically, the enjoyment of the opium-eater gradually diminishes as his system becomes habituated to the drug. From time to time he must increase the quantity which he takes, but at length no increase will produce any effect. Under these circumstances he has recourse to a dangerous expedient: he mixes a small quantity of corrosive sublimate with the opium, the influence of which is thus for a time renewed. Then these means also fail; when the victim must bear the miserable condition to which he is reduced, until probably, sooner or later, he sinks into the grave. On the excitable temperament of the Malays and Javanese, a strong dose of opium causes a state of frantic fury amounting almost to madness, and this often ends in that homicidal mania which has been called 'running amuck;' in other words, in the individual attacking with his crease or dagger every one whom he meets, so that it becomes necessary to shoot him down with as little compunction as we do a mad dog. In Java, opium is not allowed to be sold except in an adulterated form, the risk of these evil consequences being thus in some measure lessened.

So far as the effects of opium on the system are concerned, it is almost entirely a matter of indifference in what way the drug is used. Whether it be taken in the solid form of pills, in the liquid form of laudanum, or inhaled from a pipe as heated vapour, it speedily exerts its pernicious and almost irresistible influence over the mind; so that few possess the iron will needed to relinquish the habit when it has once been fairly acquired. How completely even the most intellectual and cultivated minds may become enslaved was well illustrated in the cases of Coleridge and De Quincey, whose highly coloured descriptions of their experiences are said to have been productive of much evil amongst the educated classes of this country. These descriptions must not, however, be regarded as safe criteria of the usual influence of opium on the colder temperament of the North European. According to Dr Christison, it seldom produces a more striking effect on the Anglo-Saxon constitution than the removal of torpor and sluggishness, thus rendering the opium-eater a pleasant and conversable companion; but these small advantages, in turn, are purchased by a period of subsequent pain and depression, the misery of which it would be difficult to exaggerate.

Opium, besides acting as a narcotic, possesses a remarkable power as a restorative. By apparently checking the natural waste of nervous energy, it enables the system to support fatigue, beneath which it must otherwise inevitably have sunk. For this reason it is much used by the Halcarras, the palanquin bearers and messengers of India, who journey almost incredible distances, furnished with nothing more than a bag of rice, a little opium, and a pot to draw water from the wells. The Tartar couriers also use it to sustain them, when compelled to travel night and day in crossing the arid deserts of Central Asia; and in some parts of the East it is administered as a restorative even to horses.

It is difficult to come to any definite conclusion as to whether the physical character of eastern

races who habitually use opium as a narcotic has deteriorated in consequence. No doubt the general belief is that even moderate indulgence must necessarily be injurious, and it is easy to point to the enervated character of the Turks and other oriental races as a probable result of the habit. But at the same time it is a disputed point among physiologists how far this belief correctly represents the truth. The opinions of many men well acquainted with the East might be quoted in opposition to it; for example, Dr Eatwell, formerly of the East India Company's service, in writing to the *Pharmaceutical Journal*, has affirmed that, as regards the great mass of the Chinese, no injurious effects of the opium they consume can be noticed, the people being generally a muscular and well-formed race. Dr Macpherson has given similar testimony in respect to the Chinese, and Dr Burnes in respect to the natives of Scinde and Cutch; whilst, on the other hand, Dr Little of Singapore is of opinion that the native population of that island would be in danger of becoming extinct from the use of opiates, were it not constantly recruited by immigration. It is, however, evident that the question can only be satisfactorily answered by knowing the real extent to which opium-eating prevails among the different eastern populations, and of this no reliable statistics can be obtained.

There is a similar want of definite information in respect to the United Kingdom. Attention was partially drawn to the subject so long ago as 1844, by an inquiry that was made into the state of large towns in Lancashire; and since that time there is every reason to believe that the evil has largely augmented. The increase in the quantities of the raw material imported would alone be sufficient to render this probable; for whilst, in 1852, the importation amounted to 114,000 pounds, it had grown to 356,000 pounds in 1872. No doubt a large portion of this enormous quantity is employed in the manufacture of morphia or other alkaloids, and is either exported or employed for legitimate medicinal purposes; but it is difficult to account for an increase in twenty years of two hundred per cent., except on the supposition that the drug is *more largely used as a narcotic than is generally believed*. The facility with which this form of vice can be concealed, renders direct evidence on the subject difficult to obtain; but such evidence as can be procured tends to prove that the above supposition is correct. We have recently been informed by the medical attendant to the workhouse in one of our larger cities, that a week rarely passes without a case of opium-eating coming to his knowledge among those who seek admission to the workhouse; and that he has known women, when suffering from the depression consequent upon their enforced abstinence, even go down on their knees to beg that he would administer to them an opiate. Again, there is reason to believe that opium is a favourite stimulant with many underfed and overworked artisans and labourers; and from inquiries made by parochial officials, clergymen, and others, this would appear to be especially the case in agricultural districts. In the fenny districts of Lincolnshire, a belief being prevalent that opium acts as a preservative against the effects of a damp climate, many of the inhabitants have in this way become addicted to its use.

Another and even more reprehensible form of the opium evil among the lower classes is to be found in the practice of administering soothing mixtures to young children for the purpose of keeping them quiet. In one instance, a mother, because her child was unwell, has been known to place a piece of crude opium in its mouth to suck, the death of the child being naturally the consequence; and though cases of such gross and culpable ignorance as this are no doubt rare, it is certain that the administration of soothing sirups and cordials is too commonly resorted to. In large manufacturing towns, where mothers are often employed in factories during the day, their infants are frequently placed for the time in the care of nurses; and these women seldom feel any compunction in administering an opiate to a child who is troublesome. It cannot be too widely known how greatly such a practice tends not only to the direct increase of infant mortality, but also to the permanent injury of the constitution, by inducing convulsions and other similar nervous diseases.

Opium in one of its forms enters largely into the composition of many of the pain-killers and patent medicines so freely advertised for domestic use in the present day, and for this reason the greatest care is needed in having recourse to any of them. Taken, perhaps, in the first instance, to alleviate the torments of neuralgia or toothache, what proves to be a remedy soon becomes a source of gratification, which the wretchedness that follows on abstinence renders increasingly difficult to lay aside. The same must be said of narcotics, such as bromide of potassium and hydrate of chloral, frequently resorted to as a remedy for sleeplessness; the system quickly becomes habituated to their use, and they can then be relinquished only at the cost of much suffering. Indeed, the last-mentioned of these two drugs obtains over the mind a power which may be compared to that of opium, and is, moreover, liable to occasion the disease known as chloralism, by which the system ultimately becomes a complete wreck.

Looking at the whole question of the medicinal use of narcotics, it is perhaps not too much to say, that they should never be employed except with the authority of a competent medical adviser.

Turning again to the narcotics of savage or but semi-civilised races, we find a species of fungus (*Amanita muscaria*) employed by the natives of Kamschatka and the adjoining provinces of Siberia. It grows plentifully in parts of Kamtchatka, and is there generally prepared for use in several ways. The inhabitants either gather it during the hottest months, and hang it in strings to dry in the open air, or leave it to ripen and dry in the ground, when it possesses stronger narcotic qualities. Small-sized specimens, covered with warty excrescences and deeply coloured, are also considered more valuable than the smooth pale ones. Sometimes it is eaten in soups and sauces, or is taken mixed with the juice of the whortleberry; but the more usual method is to swallow it whole, rolled into the form of a pill, and a single large-sized toadstool thus taken is sufficient to cause the narcotic effects during a whole day. These bear a very close resemblance to those of ordinary intoxication, and, like them, often end in complete insensibility. Whatever may be the natural temperament of the individual shews itself with unusual distinctness. A man who is fond of music

or of talking will be constantly singing or chattering; and secrets often thus slip out, the disclosure of which is the source of much subsequent trouble. In this form of narcotism, too, the power of estimating the size of objects is temporarily destroyed, so that a man wishing to step across a straw or a small twig will raise his foot as though about to step across the trunk of a tree.

The Siberian fungus is not the only narcotic in which this last peculiarity is found. Similar erroneous impressions are caused by the Indian hemp, which, though it is used in south-western Asia, and indeed, in the Brazils as well, is more properly the narcotic of the African continent, where it is known to the native races from the Mediterranean to the Cape of Good Hope. It is the same plant that is grown in Europe for the sake of its valuable fibre; for, though probably indigenous to India, it is able, like the potato and the tobacco plant, to adapt itself to a great variety of climates, and is grown even in the north of Russia. Its narcotic virtues depend on a resinous substance contained in the sap; and this is much more abundant in tropical climates than it is in temperate. Indeed, the European plant is almost devoid of it, though it possesses a strong odour which has been known to make people ill who have remained long in a hemp-field. Thus, when the dried plant is either smoked or eaten, its effects are both rapid and powerful. In Morocco, where the dried flowers are generally smoked, a single pipe not larger than an ordinary tobacco-pipe is sufficient to intoxicate. Among the Arabs and Syrians, the usual method is to boil the leaves and flowers in water mixed with butter to the consistence of a syrup, which is called *hashisch*, and as it has an extremely disagreeable taste, is eaten in a conffection of cloves, nutmegs, and other spices. But however the narcotic may be used, the pleasure it affords is much the same in character. It has been described as consisting in 'an intense feeling of happiness, which attends all the operations of the mind. The sun shines on every thought that passes through the brain, and every movement of the body is the source of enjoyment.' But the most remarkable peculiarity of the Indian hemp has yet to be mentioned: a dose of the resin has been known to occasion that strange condition of the nervous system called catalepsy, in which, notwithstanding the force of gravity, the limbs of the unconscious patient remain stationary in whatever position they may be placed.

The use of the coca-tree as a narcotic in Peru and Bolivia is of very great antiquity. When the Spaniards landed under Pizarro, they found the natives chewing the dried leaves, in exactly the same way in which they have continued to chew them down to the present day. Efforts were indeed made, soon after the subjugation of the country, to put a stop to the practice, for the plant had acted an important part in the Peruvian religious ceremonies, and its use was looked upon by the conquerors as an obstacle to the spread of Christianity. Nevertheless, the Indians persevered in spite of every prohibition and severity. Before long, too, the owners of mines and plantations discovered that it was to their interest to connive at the habit, as, with its aid, their labourers were able to perform more work on a given quantity of food than they could do without it. It has thus gradually

become the universal custom to allow from fifteen to thirty minutes, three or four times a day, for the purpose of chewing. At these times the first object of the Indian is to make himself as comfortable as possible, for the coca fails to produce its effect unless the chewer be perfectly quiescent. He stretches himself at full length in the shade, on a couch of dry leaves or soft turf, and rolling a few of the coca-leaves into a ball, conveys them into his month; adding immediately, to bring out the full flavour, a small quantity of unslaked lime, or of the alkaline ashes of certain plants. When thus engaged, the apathy he displays to everything around him is something marvellous. No entreaty on the part of his employer will induce him to move, and if he be a confirmed *coquero*, he is indifferent even to drenching rain or the roar of wild animals in the neighbouring thicket. In what way the pleasures of the coca-leaf manifest themselves is not known, but they must evidently be of a very seducing kind, thus to render men insensible to personal danger.

Notwithstanding the wide prevalence of the use of narcotics, little or nothing is known of the way in which their different effects are produced on the system; and the problem is complicated by the number of active substances that enter into their composition. Opium, besides other more ordinary ingredients, contains no fewer than eleven peculiar organic compounds, all of which are believed to share in producing its usual effects. It has, however, been noticed that many symptoms of narcotism bear a close resemblance to those of insanity. The wild laughter of a man under the influence of the deadly nightshade cannot be distinguished from that of a maniac, and the false impressions as to the size of objects, caused by the Indian hemp and the Siberian fungus, are a permanent feature in the malady of many lunatics. It has been suggested by Dr Carpenter that much light might be thrown on the connection between the mind and the body by studying the phenomena of drunkenness, and it seems probable that those of narcotism in different parts of the world might be made to yield equally rich results. Of one thing we may be quite certain. The use of tobacco has become a positive vice. The wastefulness of money which it causes, without a compensatory advantage, is alone deplorable.

PENNY ICES.

IN going through the busy streets of London, one cannot help noticing a new trade that has been struck out—the sale of penny ices, conducted by means of wheeled barrows on the side of the thoroughfare. Likely enough, the vendor is surrounded by spendthrift little boys, who lap in the frozen ‘cream’ as blissfully indifferent to its composition as they are unconcerned about the process by which the phenomenon of freezing is brought about under a broiling sun. This happy indifference is not exactly confined to young gentlemen who take their refreshment at barrows in the streets, and perhaps it is as well that it should not be. As a general rule, it is perhaps better not to inquire too closely into the production of what we eat and drink. But the freezing of cream at a time of year when dogs are popularly supposed to go mad from heat, and

people are every day falling down from sunstroke, is a phenomenon of so striking a character, that, but for our familiarity with it, it would probably arrest the attention of most of us.

It is one which certainly ought to arrest attention, for it is one which illustrates in a very interesting way not only the operation of natural forces which are continually working mighty and innumerable changes on the face of the earth, but—what will probably strike most minds as something even more curious and interesting still—it shews how the Creator has, as it were, interposed to check the too violent operation of His own laws, and to arrest the rapidity of changes which, without some such check, would speedily reduce this beautiful earth of ours to a condition of chaotic ruin and utter desolation.

Nothing can be simpler than the actual process of freezing adopted by our locomotive manufacturers of penny ices, and indeed by confectioners generally. It consists merely in putting into a metal cylinder whatever is to be frozen—new milk, fresh eggs, loaf-sugar, and fresh butter, are the ingredients which the Confectioners’ Journal gives for ice-cream—surrounding it with equal quantities of broken ice and salt, and rapidly spinning it round, so as to produce a little friction.

Now, everybody knows, or may know by trying it, that ice alone would not freeze the contents of the cylinder. It would simply melt slowly away, of course making whatever was near it very cold, but not cold enough to freeze. Indeed, it would seem ridiculous to suppose that the temperature which would melt the ice could possibly freeze the cream that was in the middle of it, especially when we raised that temperature by causing friction. Common-sense might suggest that while the cream got colder, the ice and the water around it would get slightly warmer, and that the result would be the immediate temperature of the two.

The supposition, however, would not be nearly so ridiculous as it would appear, and common-sense would be quite wrong as to the facts of the temperature.

The cream certainly will not freeze with ice alone around it, but it will come a great deal nearer to freezing-point than might be expected; for, although it will keep on giving out its heat to the surrounding ice, it will not make the ice in the slightest degree warmer, even though the process be aided by friction. So long as a particle of ice remains unmelted, the ice itself and the water it is in will stand at one fixed temperature, however much heat may be imparted to it; and unless the cream is in contact with something that ever communicates warmth to it, it will continue to get colder and colder so long as an atom of ice remains near it.

The explanation of this is to be found in a law which, like that of gravitation and many other natural laws, we can see in operation, without in the least degree comprehending it. The law is this: that where a solid body like ice becomes a fluid body like water, a certain amount of heat is always absorbed and concealed by the fluid. In the same way, when a liquid like water becomes a vapour like steam, a certain amount of heat is absorbed and concealed by the steam. The cream in the cylinder gives out its heat to the ice; but instead of the heat making it warmer, it helps to melt the ice, and then totally disappears in the

water. It does not make the water warmer any more than it did the ice; it is hidden or *latent* heat. It cannot be detected in any way either by the sense or by the thermometer; but it is quite certain that it is there, and if we convert the water back again into ice, it will immediately make its appearance, and will affect the thermometer.

A solid is never converted into a liquid, or a liquid into a vapour, without the consumption of more heat than would be required to effect the change, if it were not for this mysterious provision of nature; and if we can contrive to produce the rarer body from the denser—the liquid from the solid, or the vapour from the liquid—very rapidly and abundantly, as we do when we mix ice and salt together, and set a metal cylinder rapidly revolving in the midst of it, everything near it, including the cylinder and its contents, will be speedily robbed of its warmth, and reduced to a temperature below freezing-point.

Thus it is, then, that we are able to produce frozen cream in the London streets during 'dog-days.' We take advantage of two natural laws, with one of which everybody is familiar enough. Everybody knows that when water is reduced in temperature to 32° Fahrenheit it becomes ice, and that when ice is exposed to a temperature above 32° it is converted into water. Everybody knows that from the surface of the ocean water rises into the air in the form of vapour; that when the vapour comes in contact with something colder than itself, such as a stratum of cold air or the top of a mountain, it condenses into clouds, and if still further chilled it falls in the form of rain, or as snow, sleet, or hail, to be again melted and evaporated. But, by itself, the law which effects these changes would bring about the most disastrous consequences. It would produce them all by a series of violent shocks, which would often be more terrible and destructive than earthquakes. Seventeen volumes of water will expand into about eighteen volumes of ice; and even with the slow and gradual process of freezing which nature has arranged for us, we see that water-pipes are burst, vessels of all kinds, from bottles to reservoirs, are riven and cracked, and even rocks and mountains are rent and torn by the irresistible force of the expansion. But suppose all this took place instantaneously; that the first cold gust of wind that swept across a body of water after it had cooled to 32° froze it at once into a solid mass; or that the water filling a crevasse in a mountain-peak were thus suddenly congealed and expanded; or that the tremendous volumes of water that are often rolling over our heads in the form of clouds were liable at any moment to congeal into ice, and come crashing down by the ton! And a thaw would often be even more ruinous than a frost. An accumulation of snow and ice on a mountain-peak or a rising ground, or even a house-top, would be simply a reservoir liable to burst at any moment, and come down in overwhelming and devastating torrents. All these and a thousand other disasters are prevented by the wise and beneficent interposition of the other law which we see at work on the ice-vendor's barrow.

Nature ordains that in every fluid a certain amount of heat shall be hidden away as a reserve force, to be brought out wherever there is a danger of too sudden a change. Nobody could tell that

the heat was there; but the moment the surrounding cold becomes so great that the fluid is in danger of being suddenly congealed into a solid, the latent heat at once betrays itself, mitigates the cold, and renders the process a slow and gradual one. On the other hand, the solid which the ice-vendor puts around his tins no sooner begins to dissolve, than the fluid it produces begins to absorb heat with such rapidity that everything around it is robbed of its warmth, and liquefaction is arrested. The change, which but for this would have been almost instantaneous, is effected slowly and by degrees; and if, notwithstanding this loss of heat, we still keep up a rapid thaw by adding salt to the ice, and by revolving the vessel, the cream within it, and everything else around, must be laid under contribution, and must part with its warmth, even though it be frozen hard, and that in a sultry thoroughfare on a broiling August afternoon.

HE GIVETH HIS BELOVED SLEEP.

BY ANTONIA DICKSON.

A LITTLE child rests on a bed of pain,
With an aching head and a throbbing brain;
A feverish flush on the soft cheek lies,
And a wistful look in the sweet blue eyes,
As the sick child moans: 'How the slow hours creep!
Will the Lord not send to His little one sleep?'

And the mother smoothed from the child's brow fair
The clustering locks of her golden hair,
And murmured: 'My darling, we cannot tell;
But we know that the Father doth all things well;
And we know that never a creature in pain
Addressed a prayer to His mercy in vain.
Time has no line that His hand may not smooth;
Life has no grief that His love cannot soothe;
And the fevered brow shall have rest at last,
In the healing shade from the Death Cross cast.
Look up, my precious one; why shouldst thou weep?
The Lord giveth aye to His loved ones sleep.'

And the little one gazed with a glad surprise
In the loving depths of those patient eyes,
Then lifted her lips for one long embrace,
And turned with a smile on her weary face.

And the mother smiled as the early morn
Marked the deep peace on the childish form,
And cried aloud in her thankfulness deep:
'The dear Lord be praised, Who hath given her sleep!'

Ay, mother—she sleeps, in that charmed repose,
That shall waken no more to earth's pains and woes,
For the Saviour hath gathered His lamb to His breast,
Where never life's storms shall her peace molest.
His dear love willed not that Time should trace
One sorrowful line on that innocent face;
Others, less favoured, might suffer their share
Of the midnight toil and the noontide glare;
Others might labour, others might weep,
But 'the Lord giveth aye to His loved ones sleep.'

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